

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 10.

November, 1908.

No. 119.

BIDENS CONNATA AND SOME OF ITS AMERICAN ALLIES.

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BIDENS CONNATA Muhl.

IN September last Mr. C. A. Weatherby and the writer made two visits to the shores of Winter Pond in Winchester, Massachusetts, a station which for generations has furnished New England botanists with local or otherwise remarkable plants. One of the conspicuous plants at that season was a *Bidens* which grew in abundance between the thicket and the sandy beach as well as in the adjacent swampy areas. The primary leaves of the plant were so unusual in their appearance, especially in having toward the base two lobes which were strongly decurrent to the winged petiole, that we gathered material for further study. Later comparison in the herbarium showed it to be a little known plant, represented in the Gray Herbarium only by a specimen collected as unusual by the late Alvah A. Eaton and the writer at Salisbury, Massachusetts, in 1902, and another collected by Professor John Macoun at Ste. Anne de Beaupré, Quebec, in 1905; while the herbarium of the New England Botanical Club has two sheets,—one collected by Mr. W. P. Rich at Spot Pond, Stoneham, Massachusetts, in 1894, the other by Mrs. Clara Imogene Cheney at Centerville, Massachusetts, in 1900. More recently Professor K. M. Wiegand and the writer have revisited the Winter Pond station; and we have found the plant with the lateral lobes of the leaves conspicuously decurrent along the petiole about Lake Waban at Wellesley, Massachusetts. The writer has also seen it in the Fresh Pond marshes in Cambridge. It is probable, then, that this peculiar plant is much

more generally distributed than its representation in the herbaria would indicate. Careful study of the material and comparison of the original description leads to the somewhat surprising conclusion that it is exactly the plant described by Muhlenberg as *Bidens connata*,¹ while the commoner plant with simple slender-petioled leaves which is passing as *B. connata* is ordinarily so distinct as to merit varietal recognition and was even characterized as a species, *B. petiolata*,² by Nuttall.

As treated by recent authors *Bidens connata* is supposed to be the plant (Nuttall's *B. petiolata*) with usually simple distinctly petioled leaves, while the occurrence of 3-lobed leaves if noted at all is considered unusual. This is a somewhat natural conclusion, since the herbarium representation of the former is so much more complete than of the latter plant. The two plants in their extreme forms are very different, but the writer has sought in vain for constant characters by which they can be clearly separated.

The surfaces of the achenes at first seemed to offer good concomitant characters; for in some plants with the slender-petioled unlobed leaves the achenes are quite smooth, while in some specimens with the broad-petioled lobed leaves they are tuberculate or warty. This presence or absence of warts on the achene has been much emphasized by European students of the group who, finding about various lakes of continental Europe *B. connata* with warty achenes, maintain that American specimens with smooth achenes cannot belong to the same

¹ *8. *BIDENS connata*.

B. floribus discoideis, calyce exteriori flore triplo longiore, foliis caulinis ternatis foliolis lateralibus connatis, floralibus oblongo-lanceolatis. W.

Bidens connata. Muhlenberg.

Verwachsener Zweyzahn. W.

Habitat in America boreali. ⊙ (v. s.)

*Caulis laevis ramosus. Folia caulina petiolata ternata, foliolis lateralibus oblongis acutis serratis sessilibus, basi inferiore in petiolum decurrentibus, foliolum intermedium petiolatum oblongum utrinque attenuatum serratum. Folia floralia et summa ramea petiolata oblonga utrinque attenuata serrata. Calyx duplex, exterior pentaphyllus, foliolis lanceolatis flore triplo longioribus; interior foliolis coloratis obtusis margine membranaceis aequalibus. Corolla discoidea. Differt a *B. frondosa* foliorum forma, calyce exteriori breviori tantum pentaphyllo.* W." — Willd. Sp. iii. 1718 (1804).

² *57. *BIDENS *petiolata.* Glabra, foliis simplicibus petiolatis angusto-lanceolatis utrinque acuminatis serratis, floribus discoideis, calyce exteriori mediocri.

⊙Low, but considerably branched. The leaves all entire, attenuated below into a longish petiole, the smaller branch leaves often nearly entire. The outer calyx small. The flowers without rays and rather small.

Hab. On the margins of ponds in various parts of New England."

Nuttall, Jour. Acad. Nat. Sci. Phila., vii. pt. 1, 99 (1834).

species.¹ This character, however, proves to be very inconstant in *B. connata* and *B. petiolata*, warty or smooth achenes occurring on plants with either type of foliage; and very often the immature achenes of the younger heads are smooth while those of the older heads are distinctly warty. In all these plants the faces of the inner achenes are prominently ribbed making the achenes 4-angled, and the awns are 4 in number, while the 3-angled outer achenes usually have 3 awns. There is, furthermore, great probability that the smooth-fruited American specimens with which recent German botanists have contrasted the warty-fruited *B. connata* are not of this species but are *B. comosa* (Gray) Wiegand (a species which long passed in American collections as *B. connata*), for, as stated by Dr. Warnstorf, in the American plant with which he was contrasting his Neuruppin material "the fruits are always smooth and usually two-awned, only occasionally having a shorter median awn"; while Professor Ascherson, writing to Dr. Robinson in 1898, stated that the so-called *B. connata* examined from America had the outer bracts of the involucre "6-8 or more" and "achenia smooth, ribs less prominent [than in the Neuruppin *B. connata*], awns 2-3"; all of which characters belong to the American *B. comosa* rather than to *B. connata*. The conclusion is, then, that in *B. connata* the presence or absence of warts and the degree of their development are characters which are not concomitant with the marked differences of foliage.

As already noted by Professor Wiegand, the plant with short broad petioles is commoner in New England while the slender-petioled form is more general westward.² Yet the plant with three-lobed leaves (typical *B. connata*) has apparently been found in Michigan, for in his Flora of Detroit, Mr. O. A. Farwell, obviously ignoring both Muhlenberg's and Nuttall's descriptions, makes the following singular disposition of the plants.

¹ "Meanwhile, my long-time friend Professor Dr. Ascherson of Berlin, who had become interested in the plant [from Neuruppin, Germany] made an examination of the Berlin Botanical Museum and referred our plant, by Mühlenberg's type specimen, in Willdenow's herbarium under no. 15,021, to *B. connatus*. The matter would have been thereby settled had I not already received from various parts of North America as *B. connatus* an entirely different plant. In this the fruits are always smooth and usually two-awned, only occasionally having a shorter median awn. They are, thus, just like those of *B. tripartitus*. On this account the specimens from the United States heretofore seen by me cannot possibly be identified with Mühlenberg's type in the Willdenow herbarium, but belong to another good species." — Warnstorf, Bot. Gaz. xxv. 48 (1898).

² "In New England the leaves are shorter petioled, while in the West the petioles are often very long (1 cm.)" — Wiegand, Bull. Torr. Bot. Cl. xxvi. 415 (1899).

- “815. *connata*, Muhl. Belle Isle, etc. Common and variable: leaves undivided incisely-cut or -serrate (the type); or pinnately three divided with the terminal division petioled,
816. var. *petiolata*, (Nutt.) (*B. petiolata*, Nutt. Jour. Acad. Philad. 7: 99).”¹

Nevertheless, in spite of Mr. Farwell's complete reversal of the proper names of the two plants, the name-bringing synonym, *Bidens petiolata* Nutt., must be taken as the basis of the preceding combination and the plant which was so clearly described by Nuttall must stand as the type of the var. *petiolata*.²

The two extremes of *Bidens connata* may be distinguished as follows.

BIDENS CONNATA Muhl. in Willd. Sp. iii. 1718 (1804). *B. connata*, var. *petiolata* Farwell, Ann. Rep. Comm. Parks and Boulevards Detroit, xi. 91 (1900) as to plant described, not *B. petiolata* Nutt. At least the primary cauline leaves three-lobed, the two lateral oblong lobes broad-based and conspicuously decurrent to the broadly margined petiole; the uppermost and rameal leaves usually unlobed, subsessile or with short margined petiole.— On shores and in swamps, Quebec to Massachusetts and Michigan and doubtless southward. Less common westward than

VAR. PETIOLATA (Nutt.) Farwell, Ann. Rep. Comm. Parks and Boulevards Detroit, xi. 91 (1900) as to name-bringing synonym but not as to plant described. *B. petiolata* Nutt. Jour. Acad. Nat. Sci. Phila. vii. pt. 1, 99 (1834). All or nearly all the leaves unlobed, tapering to slender or narrowly margined petioles.— Common from Maine to Minnesota and Kansas.

BIDENS TRIPARTITA L.

As already noted, the discovery at several stations in Europe of the American *Bidens connata* has given rise to considerable discussion among European botanists, and since it was first called to notice many additional stations have been reported. It is, therefore, interesting to record the occurrence in North America of the European *B. tripartita* L. of which *B. connata* Muhl., *B. frondosa* L., and *B. vulgata* Greene are the common American representatives.

In August, 1904, while visiting Percé, Gaspé Co., Quebec, with

¹ Farwell, Ann. Rep. Comm. Parks and Boulevards Detroit, xi. 91 (1900).

² There is a slight possibility that *Bidens tripartita* L., var. ? *fallax* Warnstorff, Verhandl. bot. Vereins für Brandenburg, xxi. 157 (1879), is the same as *B. connata*, var. *petiolata*, for Warnstorff describes it with “meistens ungetheilten Stengelblätter”; but he later (Bot. Gaz. xxv. 58) states that his plant matches Muhlenberg's type of *B. connata* in the Willdenow herbarium.

Professor J. F. Collins and Dr. A. S. Pease, the writer came upon a colony of *Bidens tripartita* in damp hollows of an Arbor Vitae (*Thuja*) swamp. The plant, which was quite new to him, suggested in some ways all three of its American allies, *B. frondosa*, *B. vulgata* and *B. connata*. Its simple leaves are on margined petioles and are variously cut, mostly into 3 or 5 coarsely toothed segments; thus differing from those of *B. frondosa* and *B. vulgata* which have the 3- or 5-foliolate leaves on marginless petioles, the terminal leaflet usually being distinctly petiolulate. From *B. connata*, the foliage of which more nearly approaches that of *B. tripartita*, it is quickly distinguished by its flattish smooth 2-3-awned achene and the conspicuously ciliate foliaceous outer bracts of the involucre.

When *Bidens tripartita* was found at Percé the writer, not knowing what it was, took it without question for an indigenous plant. It was growing with native species in a partly cleared swamp not far, however, from the telegraph road which passes through the village. It has been seen nowhere else in the Gaspé Peninsula and it is possible that it may have been introduced from Europe, but its occurrence only in the swamp and not about the village or the wharves points to its probable indigenous character. In this connection it is noteworthy that the clearly indigenous flora of the Percé region — that of the mountain-crests, woods and primitive swamps — contains many species common in northern Europe but rare or unknown in temperate America except about the Gulf of St. Lawrence. Among such plants may be mentioned *Catabrosa aquatica* (L.) Beauv., typical *Glyceria fluitans* (L.) R. Br., *Poa alpina* L., *Scirpus rufus* (Huds.) Schrad., *Thalictrum alpinum* L., *Draba incana* L. (true), *Drosera anglica* Huds., *Pleurogyne rotata* (L.) Griseb., *Lappula deflexa* (Wahlenb.) Garcke, *Euphrasia arctica* Lange, *E. borealis* Towns., and *Rhinanthus stenophyllus* (Schur) Schinz & Thellung. It is probable, then, that *Bidens tripartita*, like the foregoing plants of northern Europe, is indigenous in the Gaspé Peninsula and that further search will show it to occur elsewhere than in the single swamp at Percé.

BIDENS HYPERBOREA Greene.

Another *Bidens* of the Gaspé Peninsula which in some of its characters suggests *B. tripartita* and *B. comosa* is a little plant which occurs in great abundance at the estuaries of rivers, where it is completely

submerged at high tide. In its leaves and involucre the plant might pass as a dwarf halophytic variant of *B. comosa*, but it has conspicuously striate 4-awned achenes more suggestive of those of *B. cernua*. From dwarf forms of the latter species, however, it is clearly distinct in its petioled or merely sessile entire or remotely dentate leaves, its ellipsoid-campanulate heads, the few (2-4) very long ascending foliaceous bracts, and the flattish, not 4-angled, achene. The writer, after studying the descriptions of recently proposed species of *Bidens*, could find only one description, that of *B. hyperborea* Greene from Rupert House, James Bay, which closely approached the Gaspé plant. In many points Professor Greene's diagnosis scarcely fitted the more eastern plant, so that the writer applied to Professor John Macoun for an opportunity to examine the type of *B. hyperborea* which is in the Herbarium of the Geological Survey Department at Ottawa. This original material which Professor Macoun generously loaned the writer is a sheet of three small plants which, as stated by Professor Greene, are quite simple and monocephalous, thus differing from the Gaspé material which is usually freely branched with very numerous heads. The Rupert House plants, furthermore, have shorter outer bracts than most of the Gaspé specimens. Except for these discrepancies the two plants are essentially alike,—in their foliage, corollas, chaff, and achenes identical. The more abundant collections from eastern Quebec add much to our knowledge of the plant, however, and that it may be more readily recognized by others who find it the following description, somewhat amplifying the original account of the species, is given.

BIDENS HYPERBOREA Greene, *Pittonia*, iv. 257 (1901). Stems 5-25 cm. high, simple, or more often slightly to freely branched, erect or depressed and matted, glabrous: leaves rather fleshy, narrowly spatulate to oblanceolate, 1.5-6.5 cm. long, 3-9 mm. broad, entire or remotely 2-4-dentate, obtuse at tip, narrowed to a sessile or short-petioled base: heads ellipsoid-campanulate, the involucre 5-10 mm. in diameter; outer bracts 2-4, strongly ascending, foliaceous, 2-6 cm. long: inner bracts 8-12, narrowly oblong, obtuse or subacute, yellow, with dark striations: chaff similar, about equaling the awns: ligules (when developed) narrowly obovate to oblong, 4-6 mm. long, deep yellow: disk-corollas funnelform, about equaling the awns; the 4 short ascending blunt teeth exceeding the purple anthers: achenes linear-cuneiform, 7 mm. long, 1.8 mm. broad at the rounded summit, flattish, about 15-ribbed on each face; the midrib scarcely thickened; the margins (and sometimes the midribs) retrorsely barbed:

awns 4, straight, retrorsely barbed, the 2 pairs unequal, the longer about 3 mm. long.— Originally described from Rupert House, James Bay. Found in August, 1904, on brackish or saline shores, submerged at high tide, near the mouths of the Bonaventure, the St. John (or Douglastown) and the Dartmouth Rivers, QUEBEC.

GRAY HERBARIUM.

FURTHER NOTES ON THE BUTTON-BUSH.

WALTER DEANE.

IN the December number of *RHODORA* for 1902 (iv. 243–4) I published an account of the persistence of the Button-bush on the farm of Mr. Augustus E. Philbrook of Shelburne, New Hampshire. The place where it grew had been drained and the bushes, though buried under three feet of sand and loam, had persisted in pushing their way up to the light, and for thirty-seven years had flourished, flowering in profusion in their most unnatural quarters, despite the fact that the space in which they grew had long been enclosed and used as a yard for pigs and hens. Notwithstanding the treatment that the Button-bush received, it grew as if unconscious of its changed surroundings.

I have visited Philbrook Farm every year since 1902 and have watched with interest the struggle for existence of my plants. Though at the time when I wrote the article I thought that there was no limit to their life, I was soon aware that each year the number of living stems was diminishing with considerable rapidity. This was apparently due wholly to the fact that the plants were being entirely denuded of their bark at the base, owing to the too great familiarity of their porcine companions.

In 1907 feeling that the little colony was playing a losing game, I had a small space of between three and four square meters enclosed in one corner of the yard.

This was done through the kindness of Mr. Philbrook who has been much interested in this singular case from the beginning. The enclosed space included the most flourishing part of the Button-bush and removed it from all noxious influences. But few plants outside the enclosure showed any signs of life.